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Evidence boosts stem cells' promise

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With patient's own cells, heart vessels and tissue show mending

By TODD ACKERMAN
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Local scientists are reporting new evidence of the effectiveness of treating congestive heart failure with a patient's own stem cells.

In a postmortem examination of a trial participant who died of an unrelated condition 11 months after receiving the therapy, the researchers found stem cells injected directly into the heart not only improved blood flow and blood-vessel formation but even grew new tissue.

"This is the first time we've achieved clear documentation of these effects in a human heart," said Dr. James Willerson, medical director of the Texas Heart Institute at St. Luke's Episcopal Hospital, which is leading the research. "We're trying to stay cautious, but this is very exciting."

Previously, imaging procedures had provided evidence of the therapy's effectiveness in patients. Such evidence, however, is not considered as definitive as evidence from the actual organ.

The therapy, unthinkable less than a decade ago, is particularly hailed in some circles because adult stem cells don't pose the ethical concerns embryonic stem cells do. Embryonic stem cells, considered more versatile, require the destruction of the embryo.

A paper describing the Texas Heart Institute researchers' findings with the deceased patient will be published in the July 26 edition of *Circulation*, the American Heart Association's journal. It was made available on the journal's Web site this week.

The patient, a 55-year-old Brazilian man who'd previously had two heart attacks, was part of a clinical trial begun four years ago on people with end-stage heart failure. That trial, a collaboration between researchers at the Texas Heart Institute and Pro-Cardiaco Hospital in Rio de Janeiro, showed improved heart function in all patients who received the injection of stem cells taken from their bone marrow.

Human trials ongoing

The results led the Food and Drug Administration last year to approve the first human trial in the United States, currently ongoing at the heart institute. There are no results from the trial yet, but Willerson said it is going well.

The postmortem exam found the Brazilian's heart showed an increase in blood vessels in the area injected with stem cells as well as the presence of substances that indicate cellular regeneration. The man died of a stroke caused by a neurological problem.

The treatment involves using a special catheter threaded through the groin. Doctors use an innovative mapping technology to identify areas in the heart that have sustained mechanical and electrical damage, then inject millions of stem cells directly into the left ventricle

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How the cells are injected:

- **Extraction:** Surgeons insert a needle into the patient's hip bone to extract 50 cubic centimeters of bone-marrow cells.
- **Process:** The cells are processed in the laboratory for about three hours to cull stem cells.
- **Catheterization:** The stem cells are immediately taken to a catheterization lab where the same patient is ready for surgery.
- **Map:** With a special catheter, surgeons electrically map the heart to identify damaged areas.
- **Injections:** After selecting 15 areas, they inject 2 million cells into surrounding healthy tissue.
- **Recovery:** Patients leave the hospital the next day. Improvement in health may begin within six weeks.

The Heart Institute's ongoing study is now open to patients with severe heart failure from outside Houston. To be considered, patients should call 832-355-6555, or e-mail their information to stemcell@heart.thi.tmc.edu

along the periphery of the damaged area.

The ongoing study at the heart institute was at one time limited to patients in the greater Houston area but is now open to other patients with severe heart failure. In all, 30 patients will participate — 20 receiving the treatment and 10 acting as a control group. Those who don't receive the treatment will have the option to do so after six months of evaluation.

Three more trials are planned. One will be in Spain; one will be a collaboration between the heart institute and an unnamed institution in the southeastern United States; and one, at the heart institute, will enroll patients with coronary heart disease but not heart failure who are waiting for transplants.

Looking toward future

Though the therapy is still in the early stages of research, Willerson said if the results continue to be positive, the team could ask the FDA for treatment approval in as little as three years. He said follow-up trials still need to determine the best patients, stem-cell types and ways to deliver the therapy.

Coronary heart disease — insufficient blood flow to the heart — affects more than 12 million Americans and is the nation's leading cause of death. Stem-cell therapy, if successful, could offer hope for patients in the end stages of the disease as well as those who undergo angioplasty and bypass surgery for cases that can't be treated with medicine.

"It's pretty amazing," Willerson, president-elect of the heart institute and president of the University of Texas Health Science Center at Houston, said of the recently unsuspected therapeutic ability of adult stem cells. "Five years ago, if I'd asked cell biologists about treating patients with heart failure with adult stem cells, I think I'd be in an insane asylum."


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